

**APPLICATION**  
**FOR**  
**UNITED STATES LETTERS PATENT**

**TITLE:**           **ATTACHMENT STRUCTURE OF REAR PANEL  
TO TUNER**

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## ATTACHMENT STRUCTURE OF REAR PANEL TO TUNER

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

5           The present invention relates to attachment structure of a rear panel to a tuner in which rear panels are attached and fixed respectively onto front surfaces of two tuners different from each other in depth size, of which each has two connector connection parts protruding in front, and a small protrusion  
10 with a tapped hole for panel attachment provided in a middle position between the connector connection parts.

#### 2. Description of the Related Art

          Conventionally an attachment structure of a rear panel to this kind of tuner has a rear panel 102 to be attached and  
15 fixed on a front surface of a tuner 101 that is smaller in depth size as shown in Fig. 4. Portions of the rear panel 102 corresponding to two connector connection parts 103, 103 and a small protrusion with a tapped hole of a tuner 101 is recessed by drawing, and then the rear panel 102 is brought into contact  
20 with the front surface of the tuner 101, and a male screw 105 is screwed into a small protrusion 104 with a tapped hole, whereby the rear panel 102 is attached and fixed.

          However, there has been a problem that structure of a die for drawing the rear panel becomes complicated.

25           Another related art is shown in Fig. 5. In structure in

which holes 201a and 201b are provided on the upper side and the lower side of a housing 201 of an electronic control device including pressed products, and one screw 104 passes through the upper hole 201a and the lower hole 201b, after the lower  
5 hole 201b has been subjected to burring, a burring hole forming side is expanded by press, and the expanded diameter by this expanding work is set to 1.3 times or more the size of the burring diameter, whereby the screw 204 that has passed the upper hole 201a becomes easy to pass through the lower hole 201b (refer  
10 to JP-A-2002-134940).

However, this structure only makes the screw 204 pass through the upper hole 201a and the lower hole 201b easily.

#### SUMMARY OF THE INVENTION

15 It is an object of the invention to provide an attachment structure of a rear panel to a tuner, in which the attachment structure can be simplified, structure of a die for molding a rear panel can be simplified, and the rear panel can be widely applicable tuners that are different in depth size.

20 The invention has been proposed in order to solve the above problem. According to a first aspect of the invention, there is provided an attachment structure of a rear panel to a tuner, in which a rear panels is attached and fixed onto a front surface of a tuner, the tuner having two connector connection parts  
25 protruding in front and a small protrusion with a tapped hole

for panel attachment provided in a middle position between the connector connection parts, the attachment structure including: the rear panel having two holes for inserting the connector connection parts in portions corresponding to the two connector connection parts of the tuner and a small cylindrical part that is formed protrusively to the tuner side by burring in a portion corresponding to the small protrusion with the tapped hole of the tuner; and a male screw; wherein the two connector connection parts of the tuner are inserted into the two holes of the rear panel, and a leading end of the small cylindrical part is brought into contact with a front surface of the small protrusion with the tapped hole of the tuner, and under this state, the male screw is inserted into the small cylindrical part from the front surface side of the rear panel and further a leading end of the male screw is screwed into the tapped hole of the small protrusion with the tapped hole of the tuner, whereby the rear panel is attached and fixed onto the front surface of the tuner.

According to a second aspect of the invention, there is provided an attachment structure of a rear panel to a tuner, in which a rear panels is attached and fixed onto a front surface of a tuner, the tuner having two connector connection parts protruding in front and a small protrusion with a tapped hole for panel attachment provided in a middle position between the connector connection parts, the attachment structure including: the rear panel having two holes for inserting the connector

connection parts in portions corresponding to the two connector connection parts of the tuner and a small cylindrical part that is formed protrusively to the tuner side in a portion corresponding to the small protrusion with the tapped hole of the tuner; and  
5 a male screw; wherein the two connector connection parts of the tuner are inserted into the two holes of the rear panel, and a leading end of the small cylindrical part is brought into contact with a front surface of the small protrusion with the tapped hole of the tuner, and under this state, the male screw  
10 is inserted into the small cylindrical part from the front surface side of the rear panel and further a leading end of the male screw is screwed into the tapped hole of the small protrusion with the tapped hole of the tuner, whereby the rear panel is attached and fixed onto the front surface of the tuner.

15 According to a third aspect of the invention, the attachment structure of a rear panel to a tuner is characterized in that the small cylindrical part of the rear panel is formed by burring, and a peripheral projection part that comes into contact with the front surface of the tuner is formed in a portion of each  
20 of the two holes by burring.

According to a fourth aspect of the invention, the attachment structure of a rear panel to a tuner is characterized in that: the small cylindrical part of the rear panel is formed by burring; in a portion of each of the two holes, a part having plural  
25 cuts in circular direction of a hole edge is formed by blanking;

the cuts are bent toward the front side of the tuner thereby to form a peripheral projection part; and a leading end of the peripheral projection part comes into contact with the front surface of the tuner.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A and 1B are diagrams showing an attachment structures of a rear panel to a tuner according to a first embodiment of the invention, in which Fig. 1A is a side view showing a state  
10 where a rear panel subjected to burring is attached and fixed to a tuner that is small in depth size, and Fig. 1B is an enlarged side view of its main portion;

Fig. 2 is a side view showing a state where a rear panel is attached and fixed to a tuner that is large in depth size;

15 Figs. 3A and 3B are diagrams showing an attachment structure of a rear panel to a tuner according to a second embodiment of the invention, in which Fig. 3A is a side view showing a state where a rear panel subjected to burring is attached and fixed to a tuner that is small in depth size, and Fig. 3B is  
20 an enlarged side view of its main portion;

Fig. 4 is a diagram showing a conventional attachment structure of a rear panel to a tuner, and also a side view showing a state where a rear panel subjected to drawing is attached and fixed to a tuner; and

25 Fig. 5 is a partially sectional view showing conventional

assembly structure of a housing.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of attachment structure of a rear panel to  
5 a tuner according to the invention will be described below with  
reference to drawings.

Figs. 1A and 1B show an attachment structure of a rear  
panel to a tuner according to a first embodiment of the invention,  
in which Fig. 1A is a side view showing a state where a rear  
10 panel subjected to burring is attached and fixed to a tuner  
that is small in depth size, and Fig. 1B is an enlarged side  
view of its main portion. Fig. 2 is a side view showing a state  
where a rear panel is attached and fixed to a tuner that is  
large in depth size.

15 In the attachment structure of the rear panel to the tuner  
according to the first embodiment, as shown in Figs. 1A, 1B,  
and 2, on a front surface of each of tuners 4A and 4B different  
from each other in depth size, in which two connector connection  
parts 1, 2 each having a step are protruded in front, and a  
20 small protrusion 3 with a tapped hole for panel attachment is  
provided in a middle position between the connector connection  
parts 1 and 2, a rear panel 5 is attached and fixed.

As shown in Fig. 1A, the rear panel 5 to be attached and  
fixed onto the front surface of the tuner 4A that is smaller  
25 in depth size has, in portions corresponding to the two connector

connection parts 1, 2 of the tuner 4A, two holes 5a, 5b for inserting these connector connection parts 1, 2, and has, in a portion corresponding to the small protrusion 3 with the tapped hole of the tuner 4A, a small cylindrical part 5c that is formed  
5 protrusively to the tuner 4A side by burring.

When the rear panel 5 is attached onto the front surface of the tuner 4A, the two connector connection parts 1, 2 with the steps of the tuner 4A are inserted into the two holes 5a, 5b of the rear panel 5, and, as shown in Fig. 1B, a leading  
10 end of the small cylindrical part 5c is brought into contact with a front surface of the small protrusion 3 with the tapped hole of the tuner 4A. Under this state, a male screw 6 is inserted into the small cylindrical part 5c from the front surface side of the rear panel 5, and further a leading end of this male  
15 screw 6 is screwed into the tapped hole of the small protrusion 3 with the tapped hole of the tuner 4A, whereby the rear panel 5 is attached and fixed onto the front surface of the tuner 4A.

Further, as shown in Fig. 2, onto a front surface of a  
20 tuner 4B which is larger in depth size, a rear panel 5 that has not been subjected to burring is attached and fixed.

Therefore, according to this first embodiment, the attachment structure of the rear panel 5 to the tuner 4A can be simplified, structure of a die for molding this rear panel  
25 5 can be simplified, and the rear panel 5 can meet widely the



tuners 4A ad 4B different in depth size.

Figs. 3A and 3B show an attachment structure of a rear panel to a tuner according to a second embodiment of the invention, in which Fig. 3A is a side view showing a state where the rear panel subjected to burring is attached and fixed to a tuner that is small in depth size, and Fig. 3B is an enlarged side view of its main portion.

In the attachment structure of the rear panel to the tuner according to this second embodiment, as shown in Figs. 3A and 3B, a small cylindrical part 5c of a rear panel 5 is formed by burring; in a portion of each of two holes 5a, 5b, a part having plural cuts 5d in circular direction of a hole edge is formed by blanking, and the cuts 5d are bent toward the front side of the tuner 4A thereby to form peripheral projection parts 5e, 5e; and a leading end of this peripheral projection part 5e comes into contact of the front surface of the tuner 4A.

Therefore, according to the second embodiment, also with the front surfaces of the connector connection parts 1, 2 of the tuner 4A, the peripheral projection parts 5e, 5e come into contact. Therefore, the rear panel 5 can be firmly attached and fixed to the tuner 4A without shaking.

Further, the two holes 5a and 5b of the rear panel 5 may be formed into the peripheral projection parts 5e, 5e by burring.

Further, the small cylindrical part 5c of the rear panel 5 may be formed by blanking.

As described above, according to the first aspect of the invention, there is provided an attachment structure of a rear panel to a tuner, in which a rear panels is attached and fixed onto a front surface of a tuner, the tuner having two connector connection parts protruding in front and a small protrusion with a tapped hole for panel attachment provided in a middle position between the connector connection parts, the attachment structure including: the rear panel having two holes for inserting the connector connection parts in portions corresponding to the two connector connection parts of the tuner and a small cylindrical part that is formed protrusively to the tuner side by burring in a portion corresponding to the small protrusion with the tapped hole of the tuner; and a male screw; wherein the two connector connection parts of the tuner are inserted into the two holes of the rear panel, and a leading end of the small cylindrical part is brought into contact with a front surface of the small protrusion with the tapped hole of the tuner, and under this state, the male screw is inserted into the small cylindrical part from the front surface side of the rear panel and further a leading end of the male screw is screwed into the tapped hole of the small protrusion with the tapped hole of the tuner, whereby the rear panel is attached and fixed onto the front surface of the tuner. Therefore, the following effects are obtained.

Namely, since the small cylindrical part is only provided

for the portion in the rear panel corresponding to the small protrusion with the tapped hole of the tuner by burring, the attachment structure of the rear panel to the tuner can be simplified, the structure of the die for molding this rear panel  
5 can be simplified, and the rear panel can meet widely the tuners different in depth size.

According to the second aspect of the invention, there is provided an attachment structure of a rear panel to a tuner, in which a rear panels is attached and fixed onto a front surface  
10 of a tuner, the tuner having two connector connection parts protruding in front and a small protrusion with a tapped hole for panel attachment provided in a middle position between the connector connection parts, the attachment structure including: the rear panel having two holes for inserting the connector  
15 connection parts in portions corresponding to the two connector connection parts of the tuner and a small cylindrical part that is formed protrusively to the tuner side in a portion corresponding to the small protrusion with the tapped hole of the tuner; and a male screw; wherein the two connector connection parts of  
20 the tuner are inserted into the two holes of the rear panel, and a leading end of the small cylindrical part is brought into contact with a front surface of the small protrusion with the tapped hole of the tuner, and under this state, the male screw is inserted into the small cylindrical part from the front surface  
25 side of the rear panel and further a leading end of the male

screw is screwed into the tapped hole of the small protrusion with the tapped hole of the tuner, whereby the rear panel is attached and fixed onto the front surface of the tuner. Therefore, the following effects are obtained.

5       Namely, since the small cylindrical part is only provided for the portion in the rear panel corresponding to the small protrusion with the tapped hole of the tuner, the attachment structure of the rear panel to the tuner can be simplified, the structure of the die for molding this rear panel can be  
10 simplified, and the rear panel can meet widely the tuners different in depth size.

      According to the third aspect of the invention, the small cylindrical part of the rear panel is formed by burring, and the peripheral projection part that comes into contact of the  
15 front surface of the tuner is formed in the portion of each of the two holes by burring. Therefore, the attachment structure of the rear panel to the tuner can be simplified, the structure of the die for molding this rear panel can be simplified, and the rear panel can meet widely the tuners different in depth  
20 size.

      Further, also with the front surfaces of the connector connection parts of the tuner, the peripheral projection parts of the rear panel come into contact. Therefore, the rear panel can be firmly attached and fixed to the tuner without shaking.

25       According to the fourth aspect of the invention, the small

cylindrical part of the rear panel is formed by burring; in the portion of each of the two holes, a part having plural cuts in circular direction of the hole edge is formed by blanking, and the cuts are bent toward the front side of the tuner thereby  
5 to form the peripheral projection part; and the leading end of this peripheral projection part comes into contact of the front surface of the tuner. Therefore, in the two holes of the rear panel, the peripheral projection parts are formed by blanking, so that the attachment structure of the rear panel  
10 to the tuner can be simplified, the structure of the die for molding this rear panel can be simplified, and the rear panel can meet widely tuners different in depth size.

Further, also with the front surfaces of the connector connection parts of the tuner, the peripheral projection parts  
15 of the rear panel come into contact. Therefore, the rear panel can be firmly attached and fixed to the tuner without shaking.